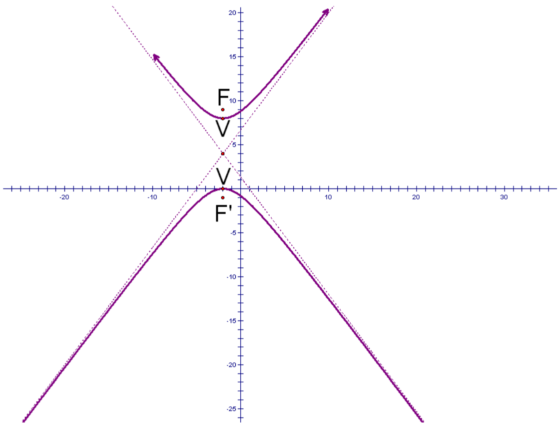
8.5 Hyperbolas

Hyperbola--the set of all points such that the absolute value of the difference of the distances from a point to two fixed points (foci) is a constant



gsp

Visual of construction

Focal radii--distances from the foci to a point P on the curve

Opens left/right

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$$

Opens up/down

$$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$$

a is not necessarily the largest, but first.

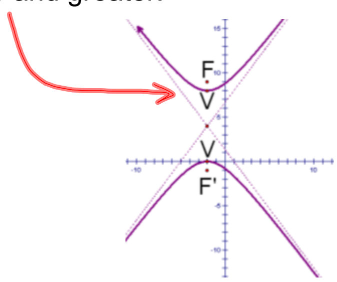
a = distance from center to vertex
b =
c = distance from center to each focus

Transverse axis--line segment of length 2a that intersects the hyperbola in 2 points (vertices)

Conjugate axis--perpendicular to transverse axis and has a length of 2b

$a^2 + b^2 = c^2$

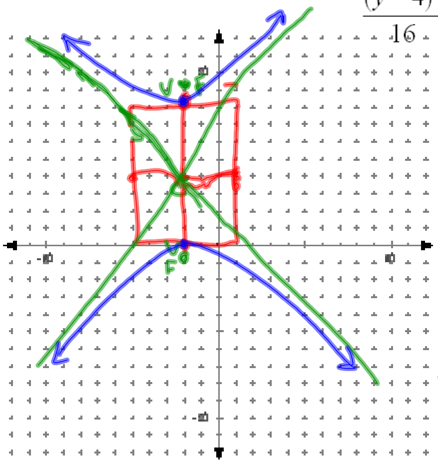
asymptote--line such that the distance between this line and a point, P, on the graph goes to 0 as the distance between P and the center becomes greater and greater.



Graph and find the equation of asymptotes

Use point slope form.

$$\frac{(y-4)^2}{16}-\frac{(x+2)^2}{9}=1$$

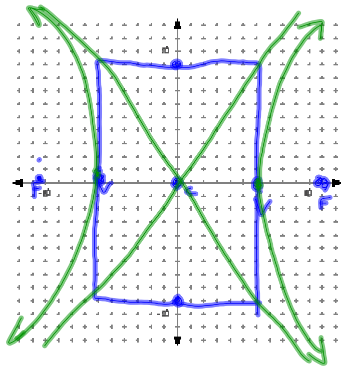


$C(-2,4)$
$a=4$
$b=3$
$c=5$
$c^2=16+9$
25
$V(-2,0)(-2,8)$
$F(-2,-1)(-2,9)$
Equations of Asymptotes
$y-4=\pm\frac{4}{3}(x+2)$

Graph and find the equation of asymptotes

$$\frac{x^2}{36}-\frac{y^2}{81}=1$$

$C(0,0)$
$a=6$
$b=9$
$c=3\sqrt{13}$ $36+81=c^2$ 117
$V(-6,0)(6,0)$
$F(3\sqrt{13},0)(-3\sqrt{13},0)$



Write the equation of a hyperbola with C(0, 0). Horizontal transverse axis, a = 8, b = 5

$$\frac{x^2}{64}-\frac{y^2}{25}=1$$

Write the equation of a hyperbola with F(10, 0) and F(-10,0). 2a = 16

$M\left(\frac{-10+10}{2},\frac{0+0}{2}\right)$
$C(0,0)$

$a=8$
$b=$ ___
$c=10$

$$\frac{x^2}{64}-\frac{y^2}{36}=1$$

$64+b^2=100$
$b^2=36$

Write the equation of a hyperbola with V(1, -2) and V(1,2). b = 2

$C(1,0)$

$$\frac{y^2}{4}-\frac{(x-1)^2}{4}=1$$

HW
p445-446
11-19odd, 23, 31,33

Attachments

hyperbola_trans_sketch.gsp